

AMENDMENT TO THE CLAIMS:

This listing of claims will replace all prior versions of claims in the application:

LISTING OF CLAIMS:

1. (CURRENTLY AMENDED) A magnetic head having an air bearing surface (ABS), comprising:
a free layer structure, comprising:
 - a first free layer having a magnetic moment;
 - a second free layer having a magnetic moment pinned antiparallel to the magnetic moment of the first free layer; and
 - a third free layer having a magnetic moment oriented parallel to the magnetic moment of the second free layer;wherein ends of the third free layer define track edges of the third free layer;
wherein the first and second free layers extend beyond the track edges in a direction parallel to the ABS for distances each at least as long as a length of the third free layer measured between the track edges thereof,
wherein portions of the first and second free layers that extend beyond the track edges are pinned antiparallel to each other.

2. (CURRENTLY AMENDED) ~~A head as recited in claim 1,~~ A magnetic head having an air bearing surface (ABS), comprising:
a free layer structure, comprising:
 - a first free layer having a magnetic moment;
 - a second free layer having a magnetic moment pinned antiparallel to the magnetic moment of the first free layer; and
 - a third free layer having a magnetic moment oriented parallel to the magnetic moment of the second free layer;wherein ends of the third free layer define track edges of the third free layer;

wherein the first and second free layers extend beyond the track edges in a direction parallel to the ABS,

wherein a net magnetic moment of the first and second free layers is about zero.

3. (CURRENTLY AMENDED) A head as recited in claim [[1]] 2, wherein the first and second free layers extend beyond the track edges for distances each at least as long as a length of the third free layer measured between the track edges thereof.
4. (ORIGINAL) A head as recited in claim 3, wherein the first and second free layers extend beyond the track edges for distances each at least five times as long as a length of the third free layer.
5. (CURRENTLY AMENDED) A head as recited in claim [[1]] 2, wherein a thickness of the first free layer is less than a combined thickness of the second and third free layers, the thicknesses being measured in a direction perpendicular to a plane of the first free layer.
6. (CURRENTLY AMENDED) A head as recited in claim [[1]] 2, wherein a thickness of the third free layer is greater than thicknesses of the first and second free layers individually, the thicknesses being measured in a direction perpendicular to a plane of the first free layer.
7. (CURRENTLY AMENDED) A head as recited in claim [[1]] 2, further comprising at least one antiferromagnetic (AFM) layer positioned outside the track edges of the third free layer in a direction parallel to the ABS, each AFM layer being for pinning a magnetic orientation of portions of the free layer closest thereto and positioned outside the track edges of the third layer.

8. (CURRENTLY AMENDED) A head as recited in claim [[1]] 2, further comprising an antiparallel (AP) pinned layer structure having at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other.
9. (CURRENTLY AMENDED) ~~A head as recited in claim 1, further comprising A~~ magnetic head having an air bearing surface (ABS), comprising:
a free layer structure, comprising:
a first free layer having a magnetic moment;
a second free layer having a magnetic moment pinned antiparallel to the
magnetic moment of the first free layer; and
a third free layer having a magnetic moment oriented parallel to the
magnetic moment of the second free layer;
wherein ends of the third free layer define track edges of the third free layer;
wherein the first and second free layers extend beyond the track edges in a
direction parallel to the ABS, and
a shield layer positioned above the free layer structure, portions of the shield layer positioned outside the track edges extending downwardly towards the portions of the free layer structure positioned outside the track edges.
10. (CURRENTLY AMENDED) A head as recited in claim [[1]] 2, wherein the head forms part of a CPP GMR sensor.
11. (CURRENTLY AMENDED) A head as recited in claim [[1]] 2, wherein the head forms part of a CIP GMR sensor.
12. (CURRENTLY AMENDED) A head as recited in claim [[1]] 2, wherein the head forms part of a tunnel valve sensor.
13. (ORIGINAL) A magnetic head having an air bearing surface (ABS), comprising:

an antiparallel (AP) pinned layer structure having at least two pinned layers with magnetic moments that are self-pinned antiparallel to each other, the pinned layers being separated by an AP coupling layer; and
a free layer structure spaced apart from the AP pinned layer structure, the free layer structure comprising:
a first free layer having a magnetic moment;
a second free layer having a magnetic moment pinned antiparallel to the magnetic moment of the first free layer; and
a third free layer having a magnetic moment oriented parallel to the magnetic moment of the second free layer;
wherein ends of the third free layer define track edges of the third free layer;
wherein the first and second free layers extend beyond the track edges in a direction parallel to the ABS for distances each at least as long as a length of the third free layer measured between the track edges thereof;
wherein a thickness of the first free layer is less than a combined thickness of the second and third free layers, the thicknesses being measured in a direction perpendicular to a plane of the first free layer.

14. (CURRENTLY AMENDED) ~~A head as recited in claim 13,~~ A magnetic head having an air bearing surface (ABS), comprising:
an antiparallel (AP) pinned layer structure having at least two pinned layers with magnetic moments that are self-pinned antiparallel to each other, the pinned layers being separated by an AP coupling layer; and
a free layer structure spaced apart from the AP pinned layer structure, the free layer structure comprising:
a first free layer having a magnetic moment;
a second free layer having a magnetic moment pinned antiparallel to the magnetic moment of the first free layer; and

a third free layer having a magnetic moment oriented parallel to the
magnetic moment of the second free layer;
wherein ends of the third free layer define track edges of the third free layer;
wherein the first and second free layers extend beyond the track edges in a
direction parallel to the ABS for distances each at least as long as a
length of the third free layer measured between the track edges thereof;
wherein a thickness of the first free layer is less than a combined thickness of the
second and third free layers, the thicknesses being measured in a
direction perpendicular to a plane of the first free layer,
wherein a net magnetic moment of the first and second free layers is about zero.

15. (CURRENTLY AMENDED) A head as recited in claim ~~[[13]]~~ 14, wherein the first and second free layers extend beyond the track edges for distances each at least five times as long as a length of the third free layer.
16. (CURRENTLY AMENDED) A head as recited in claim ~~[[13]]~~ 14, wherein a thickness of the third free layer is greater than thicknesses of the first and second free layers individually, the thicknesses being measured in a direction perpendicular to a plane of the first free layer.
17. (CURRENTLY AMENDED) A head as recited in claim ~~[[13]]~~ 14, further comprising at least one antiferromagnetic (AFM) layer positioned outside the track edges of the third free layer in a direction parallel to the ABS, each AFM layer being for pinning a magnetic orientation of portions of the free layer closest thereto and positioned outside the track edges of the third layer.
18. (CANCEL)

19. ~~A head as recited in claim 13, further comprising~~ A magnetic head having an air bearing surface (ABS), comprising:
an antiparallel (AP) pinned layer structure having at least two pinned layers with magnetic moments that are self-pinned antiparallel to each other, the pinned layers being separated by an AP coupling layer; and
a free layer structure spaced apart from the AP pinned layer structure, the free layer structure comprising:
a first free layer having a magnetic moment;
a second free layer having a magnetic moment pinned antiparallel to the magnetic moment of the first free layer; and
a third free layer having a magnetic moment oriented parallel to the magnetic moment of the second free layer;
wherein ends of the third free layer define track edges of the third free layer;
wherein the first and second free layers extend beyond the track edges in a direction parallel to the ABS for distances each at least as long as a length of the third free layer measured between the track edges thereof;
wherein a thickness of the first free layer is less than a combined thickness of the second and third free layers, the thicknesses being measured in a direction perpendicular to a plane of the first free layer, and
a shield layer positioned above the free layer structure, portions of the shield layer positioned outside the track edges extending downwardly towards the portions of the free layer structure positioned outside the track edges.
20. (CURRENTLY AMENDED) A head as recited in claim ~~[[13]]~~ 14, wherein the head forms part of a CPP GMR sensor.
21. (CURRENTLY AMENDED) A head as recited in claim ~~[[13]]~~ 14, wherein the head forms part of a CIP GMR sensor.

22. (CURRENTLY AMENDED) A head as recited in claim ~~[[13]]~~ 14, wherein the head forms part of a tunnel valve sensor.
23. (CURRENTLY AMENDED) A magnetic storage system, comprising:
magnetic media;
at least one head for reading from and writing to the magnetic media, each head having:
a sensor having the structure recited in claim ~~[[1]]~~ 2;
a write element coupled to the sensor;
a slider for supporting the head; and
a control unit coupled to the head for controlling operation of the head.